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FOUR NEW ARCTIC FOXES.

BY C. HART MERRIAM.

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The White or Arctic fox of Lapland\* and Siberia was described by Linnæus in 1758 under the name *Canis lagopus* (Syst. Nat., Ed. 10, p. 40, 1758). A related form from Iceland (the Sooty fox of Pennant), was named *Canis fuliginosus* by Shaw in the year 1800 (Gen. Zool., Vol. I, pt. II, p. 331, 1800). So far as I am aware no other names for members of the group were proposed until 1898, when Barrett-Hamilton and Bonhote in a joint paper described a small form from Spitzbergen as subspecies *spitzbergenensis* (Ann. & Mag. Nat. Hist., 7th ser., I, p. 287, April, 1898). But they state that they are unable to distinguish the Spitzbergen form from the one from Iceland—named *fuliginosus* by Shaw a century earlier. If the two are the same, *spitzbergenensis* of course becomes a synonym of *fuliginosus*.

In 1900 I described a small Arctic fox from Hall Island, Bering Sea, under the name *hallensis* (Proc. Wash. Acad. Sci., II, p. 15, March 14, 1900).

The material at present available for study is utterly insufficient to admit of a satisfactory revision of the group. Barrett-Hamilton and Bonhote had few if any skins with skulls from

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\*The type locality may be restricted to Lapland.

the old world, and none at all from America. Our National Museum is decidedly better off, especially with reference to material from Alaska and Labrador, but we still lack reliable flesh measurements, and also lack series of skins and skulls put up according to modern standards.

An examination of the specimens in the collections of the Biological Survey and the National Museum shows that several unrecognized forms exist. The animal inhabiting the mainland of Alaska and Canada from the mouth of the Yukon and Point Barrow easterly to Hudson Bay and Cumberland Island differs both from true *lagopus* of Scandinavia and from the animals inhabiting islands in Bering Sea.\*

The most perplexing Arctic foxes I have seen are from Pribilof Islands in Bering Sea.† The skulls from St. Paul Island are of three sizes; a very large and long skull with long and rather slender rostrum, like a red fox; a very small skull with small teeth (smaller even than our specimens of *hollensis*); and one which is intermediate in size and characters between the others and which agrees essentially with the common Arctic fox of the Alaska mainland. The collections contain a number of skulls of each of these three forms, though the number of the smallest size is much less than of the others. What do these facts signify? Three theories occur to me: (1) that the large skulls represent a large resident species while the two others are stragglers from St. Matthew [or some other] Island and the mainland respectively, reaching the Pribilofs by means of the pack ice; (2) that the large skulls represent a large resident species; the small ones stragglers from St. Matthew [or some other] Island, while the middle sized ones are hybrids between these two; (3) that all three belong to a single species which presents extraordinary and unprecedented variations in size.

Personally, I believe that the large animal is a well marked

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\*A specimen in the National Museum from Cumberland Island is essentially identical with specimens from Alaska except that the lower premolars are somewhat larger, in this respect resembling the Labrador form, which is here described as subspecies *ungava*.

†The National Museum has a series of skulls and several skins from St. Paul Island, collected by Dr. F. W. True, Dr. D. W. Prentiss, and Mr. Wm. Palmer; and during my visit to the islands in 1891 I secured several specimens on St. George Island.

insular species; the small one a straggler from Hall or St. Matthew [or some other] Island, the others hybrids between these two, or in some cases perhaps, stragglers from the mainland. On this assumption I have named the large form *pribilofensis*. In winter the pack ice from the north often reaches St. Matthew Island and sometimes pushes south to the Pribilofs. The distance between St. Matthew and St. Paul is about 225 statute miles; that between Nunivak (from which we have no specimens) and St. Paul is even less. But wherever the animals come from, the fact is well-known that when the pack ice reaches the Pribilofs, white foxes come ashore on the Islands. They have been seen to do this repeatedly. When observed, they are pursued and killed, if possible, in order to prevent interbreeding with the native blue foxes.

On Bering Island, on the Siberian side of Bering Sea, there appear also to be two forms: the mainland species (*lagopus*) and a large insular species here named *beringensis*.

*Pelages*.—The characteristic markings of the Arctic foxes are: *In winter pelage*, white throughout, the only marking being the small black pad on end of nose; *in summer pelage*, head, back, a cross-bar over shoulders, outer side of fore and hind legs, upper surfaces of fore and hind feet, and stripe on upper-side of tail, brownish dusky, usually darkest on top of head and rump; face strongly, feet moderately mixed with white hairs; ears strongly edged with white; chin grayish dusky; underparts soiled whitish or buffy, becoming strongly buffy on flanks.

The Blue fox of the Pribilofs is a sooty-blue all over at all seasons.

*Sexual differences*.—As usual among foxes the males are somewhat larger than the females. Among the Arctic foxes the difference in size of skull is usually not great, but the large upper molar, and the carnassial above and below are noticeably larger in the males.

The Arctic foxes here recognized in North America (including Bering Island but excluding Greenland) are as follows:

*Vulpes lagopus* (Linn.). Type locality Lapland. Believed to occur on Bering Island.

*Vulpes lagopus innuitus* nob. Type locality Point Barrow, Alaska. Ranges from Alaska to Baffin Bay.

*Vulpes lagopus ungava* nob. Type locality Ungava, Labrador.

*Vulpes hallensis* (Merriam). Type locality Hall Island, Bering Sea. Occurs on St. Matthew Island also.

*Vulpes pribilofensis* nob. Type locality St. George Island, Pribilof Islands, Bering Sea. Occurs on St. Paul Island, also.

*Vulpes beringensis* nob. Type locality Bering Island, Bering Sea.

#### ***Vulpes lagopus innuitus* subsp. nov.**

*Type* from Point Barrow (Karogar River), Arctic Alaska. No. 107,626, ♀ ad., U. S. National Museum, Biological Survey Collection. June 27, 1898. E. A. McIlhenny. Original No. 831.

*Characters*.—Similar to *lagopus* in size and general characters, but braincase broader and more pyriform, and tapering much more abruptly behind broadest part; nasals much broader. Contrasted with *pribilofensis* it is so much smaller and shorter as not to require close comparison. Contrasted with *hallensis* it may be distinguished by the following characters: nasals broader; median frontal sulcus deeper; rostral constriction less pronounced; lower premolars larger (most noticeable in third and fourth); first upper molar larger. Contrasted with *ungava* the frontal shield is flatter and the postorbital processes are heavier and more deeply excavated posteriorly.

*Cranial measurements*.—Skull of type specimen ♀ ad.: basal length 117; zygomatic breadth 69; palatal length 60; postpalatal length 56; breadth of rostrum at second premolar 23.5; upper carnassial (on cingulum) 12.5; first upper molar (transverse diameter from notch on outer side) 10.

#### ***Vulpes lagopus ungava* subsp. nov.**

*Type* from Fort Chimo, Ungava, Labrador. No. 23,195, [♂ ad.] U. S. National Museum. Collected by L. M. Turner. Original No. 2,362.

*Characters*.—Similar to *innuitus* but slightly larger; rostrum slightly longer; frontal shield less flat, swollen anteriorly on each side of median sulcus; postorbital processes more pointed, less massive, and less deeply excavated posteriorly; under jaw much broader vertically and deeply bellied under sectorial.

Compared with *Vulpes lagopus* from Lapland and Sweden, *ungava* differs as follows: postorbital processes more decurved and pointed and less excavated posteriorly; braincase broader and more pyriform (broadly inflated on plane of posterior edge of posterior root of zygoma, behind which it tapers much more abruptly); frontal shield less flattened; nasal broader; crown of fourth lower premolar larger and longer; base of

skull decidedly shorter, as shown in shorter basioccipital and basisphenoid and in the distance from foramen magnum to plane of upper sectorial; similarly, the lower sectorial is nearer the condyle. Under jaw much broader vertically and more bellied under sectorial.

*Measurements.*—Skull of type specimen: basal length 118; zygomatic breadth 70; palatal length 63; postpalatal length 55; breadth of rostrum at second premolar 26; upper carnassial (on cingulum) 12.5; first upper molar (transverse diameter from notch on outer side) 9.5.

***Vulpes pribilofensis* sp. nov.**

*Type* from St. George Island, Pribilof Islands, Bering Sea. No. 42,624, ♂ ad., U. S. National Museum, Biological Survey Collection. August, 1891. C. Hart Merriam.

*Characters.*—Largest of the *lagopus* group. Skull much elongated, resembling that of a Red fox more than that of the Arctic foxes; rostrum long and set far forward, the postpalatal length exceeding that of any other known form. In the type specimen the frontals are narrow anteriorly and the postorbital processes are only slightly developed. In skulls from St. Paul Island the frontal shield is broader and the postorbital processes are much more prominent. Contrasted with skulls of *Vulpes* from the mainland (St. Michaels and Lower Yukon region) the differences are very marked. *V. pribilofensis*\* is larger throughout but the difference is most marked in the total length and zygomatic breadth, and in the greater production of the rostrum. The rostrum is not only longer but is set much farther forward so that the postpalatal length is very much greater. In most specimens the palatal and postpalatal lengths are subequal, but in one or two skulls of old males from St. Paul Island the palatal length considerably exceeds the postpalatal. [In *V. innuitus* the postpalatal length is always very much less than the palatal.] The braincase is longer and flatter; the sagittal crest more strongly developed posteriorly; the frontal hump (at base of nasals) more marked. The teeth are essentially the same as in *innuitus*. The species requires no comparison with the small *V. hallensis* from Hall and St. Matthew islands.

*Cranial measurements.*—Skull of type specimen (♂ ad.): basal length 127; zygomatic breadth 72; palatal length 66; postpalatal length 61; breadth of rostrum at second premolar 25; upper carnassial (on cingulum) 12.5; first upper molar (transversed diameter from notch on outer side) 9.5. An old ♂ from St. Paul Island: basal length 130; zygomatic breadth 78; palatal length 67; postpalatal length 62; breadth of rostrum at second premolar 26.

***Vulpes beringensis* sp. nov.**

*Type* from Bering Island, Bering Sea. No. 47,109, [♀ yg. ad.], U. S. National Museum, Biological Survey Collection. June 3, 1892. B. W. Evermann.

*Characters.*—Size large, nearly equalling *pribilofensis*; rostrum broad and massive; frontals high anteriorly and swollen on each side of median sulcus; premolars large and swollen. Compared with *lagopus* the skull is decidedly larger; the rostrum and nasals broader; frontals more elevated anteriorly; molars and premolars larger. Compared with *pribilofensis*, with which it nearly agrees in size, the rostrum is shorter and broader; rostral constriction or 'step' much more pronounced; frontals anteriorly more elevated; base of cranium shorter; molars and premolars decidedly larger and more swollen.

*Cranial measurements.*—Skull of type specimen [♀ yg. ad.]: basal length 123; zygomatic breadth 71; palatal length 66; postpalatal length 56; breadth of rostrum opposite second premolar 27. An old ♀ from type locality: basal length 128; zygomatic breadth 77; palatal length 68; postpalatal length 60; breadth of rostrum at second premolar 26. Upper carnassial (on cingulum) in young ♂ 13.5; first upper molar (transverse diameter from notch on outer side) 11.